LOUISIANA DIVISION INDUSTRIAL HYGIENE REPORT
AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY

DEPARTMENT	FILE NUMBER	DATE
ETHANOLAMINES/GLYCOL ETHERS	LAD-EAP-92.01	12/10/92

TITLE

EVALUATION OF EMPLOYEE'S EXPOSURE TO DOWANOL*PM SERIES, DOWANOL*EB SERIES, ETHANOLAMINES SERIES, NOISE AND ASSOCIATED INDUSTRIAL HYGIENE ACTIVITIES AT THE LOUISIANA DIVISION ETHANOLAMINES/GLYCOL ETHERS PLANT, PLAQUEMINE, LOUISIANA DURING 1990 AND 1991.

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SUMMARY:

During 1990 and 1991, personal time-weighted average(TWA) sampling, excursion short term sampling, and area type sampling were conducted in the Ethanolamines/ Glycol Ethers plant. The monitoring was carried out to evaluate exposures to Dowanol*PM, Dowanol*EB, N-Butanol, Monoethanolamines(MEA), Diethanolamines(DEA), and Triethanolamines(TEA). An area Noise survey of sound levels throughout the block was made.

The results of personal type monitoring for exposures to Dowanol*PM during various routine and non-routine tasks ranged from None Detected(N.D.)(0.14-0.56ppm) to 3.0 parts per million(ppm). Area type sampling, for airborne levels of the same material ranged from the Limit of Quantitation(L.O.Q.)(<0.12ppm) to 190 ppm. The 190 ppm result was a 40 minute sample obtained during open dome loading of a tank car with the sampling device located near the dome. The 8-Hr TWA exposure guideline for Dowanol*PM is 100 ppm.

Personal type monitoring results for exposures to Dowanol*EB were all N.D.(0.14 to 0.69 ppm). Area type sampling results for airborne levels of Dowanol*EB ranged from N.D. (0.10ppm) to 4.2 ppm. The 8-HR TWA exposure for Dowanol*EB is 25 ppm.

(Continued on page 2)

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SUMMARY: continued

Potential employee exposure during a 25 minute task of collecting quality control samples from a barge of N-Butanol was 8.0ppm. This is a potential exposure because a half face organic vapor acid gas(OVAG) respirator was worn. The exposure guideline for N-Butanol is a 50 ppm ceiling limit.

Employees' exposures to Monethanolamine(MEA) ranged from N.D. (0.01 ppm) to 231 ppm. The 231 ppm MEA sample, taken during a 29 minute period while loading a MEA tank car, most likely involved liquid contact with the sample tube in order to obtain such a high reading. The same tank car loading job that yielded the high MEA result also showed 16ppm Diethanolamines(DEA) and 28 ppm Triethanolamines(TEA) readings which should not have been present in high purity MEA. The validity of the sample is questionable. A re-test of the same job over 480 minutes resulted in none detected amounts for all compounds. A half face respirator with OVAG cartridges was worn during loading. The 8-Hr TLV-TWA for MEA and DEA is 3 ppm. No exposure limit has been established for TEA.

An area noise survey of the Ethanolamines/ Glycol Ethers plant was conducted in 1991. Noise level readings ranged from 68 dBA to 102 dBA. Those areas with noise levels above 90 dBA require the use of hearing protectors. The use of high noise generating tools (e.g. impact wrenches) also require the use of hearing protectors.

The laboratory fume hoods were evaluated in 1991 for face velocities. Both hoods were rated class B on the stipulation that the sashes be operated at 18 inch openings.

Block 55 personnel training for 1990 and 1991 included Hazcom, respiratory protection, a review of MSDS's, hazardous materials loading/ unloading, and block asphyxiants.

In 1991, the annual survey of Asbestos material in the block was completed. Procedures with the condition and/ or labeling were noted along with the necessary follow-up. Replacement of Asbestos material with non- Asbestos where feasible continued to be the practice.

The reports containing the Glycol Ethers monitoring results are located in the Environmental Services lab. The book number is 0217 and the results are located on pages 20,21,24,49,100, and 112. The samples were analyzed and results reported by Louise Almo, Lorinda Edwards, and J. Chustz.

The reports containing the Ethanolamines monitoring results are located in the R&D analytical laboratory, Bldg. 2503. The samples were analyzed by David Smith and reviewed by Steve Caldwell. The book number and pages are:
book-5341 pages- 22,23,28,29
book-5254 pages-6,7,8
book-5684 page-4
folder-9102.049

PURPOSE

As part of a continuous effort to provide a healthful and safe environment for personnel of the Ethanolamines/Glycol Ethers plant, a program to evaluate employees exposure to Dowanol PM, Dowanol EB, N-Butanol, Monoethanolamine, Diethanolamine, Triethanolamine and noise was conducted in 1990 and 1991. This report addresses the work performed including recommendations for 1992.

CONCLUSIONS

1.Dowanol PM:

In 1990 and 1991 personal and area type sampling were conducted to determine airborne concentrations of Dowanol PM during various job tasks and plant operations. The results for the personal type samples ranged from N.D. (0.14 ppm) to 3 ppm. The area sampling results ranged from L.O.Q. (<0.12 ppm) to 190 ppm. The 190 ppm area sample was taken while a Dowanol PM tank car was being loaded with the sampling device setting in the dome area. A personal type sample of the very same operation, a Dowanol PM tank car loading, resulted in a reading of L.O.Q. (<0.90 ppm). The ACGIH eight hour TLV-TWA for Dowanol PM is 100 ppm.

2.Dowanol EB:

In 1990, personal and area type monitoring were conducted to determine airborne concentrations of Dowanol EB during various job tasks and plant operations. The results for the personal type samples were all none detected ranging from 0.14 ppm to 0.69 ppm. The area type sampling resulted in readings ranging from N.D. (0.10 ppm) to 4.2 ppm. The ACGIH 8- hour TLV-TWA for Dowanol EB is 25 ppm. A personal type sample was taken during the sampling of a N-Butanol barge. The result for this sample was 8 ppm. The OSHA permissible exposure limit for Butanol is a ceiling value of 50 ppm.

3. Ethanolamines:

In 1990 and 1991, personal and area type sampling was conducted to determine airborne concentrations of monoethanolamine (MEA), Diethanolamine (DEA), and Triethanolamine (TEA) during various job tasks and process operations. The personal type sampling results for MEA, DEA, and TEA ranged from N.D. (0.01 ppm) to 231 ppm, from N.D. to 16 ppm, and from N.D. to 28 ppm, respectively. The high results for all three compounds were obtained from a sample taken during the loading of an monoethanolamine tank car. The validity of this sample is questionable since the high purity MEA produced contains no TEA, and the MEA and DEA levels reported are high compared to previous results, and to reach 231 ppm MEA in a 29 minute sample would almost certainly require liquid contact. A personal 8- hour TWA type sample of this same job produced none detected (N.D.) results for all three compounds.

Two excursion type area samples were collected in 1990 during the loading of MEA tank cars. The location of the pumps and tubes for each sampling were selected to provide "worse case" downwind, in close proximity to the open dome data. The airborne levels of MEA for these two samples were 25 ppm and 7.3 ppm. These results were significantly less than the 231 ppm personal sample taken in 1991.

4.Noise:

In 1991, an area noise survey was completed. Results of that survey showed that the high noise level areas in the block are the drumming line (95-105 dB(A)), due to noise of short term duration associated with the operation of an impact wrench. The tank car loading rack (97 dB(A)) during the use of an impact wrench, and the C-550 compressor area (98 dB(A)). The high noise areas were posted with warning signs. Drumming line and tank car rack procedures were changed reflecting the higher noise readings. Operators are required to wear hearing protection while using impact wrenches.

5.The laboratory fume hoods were surveyed in 1991 for face velocity measurements and smoke capturing performance. Both hoods, the north and the south, met the requirements of a "B" classification with restricted sash openings of 18".

6.During 1990 and 1991, personnel received training on respiratory protection, hazardous chemical loading/unloading and Hazcom.

7.During 1991, the annual asbestos maintenance program was conducted. All asbestos in the block was examined for damage and proper labeling. Problem areas were documented and repairs were made by trained asbestos abatement personnel. Where possible, non-asbestos material was substituted for asbestos during maintenance related activities.

RECOMMENDATIONS

1. Do task sampling during the loading of Ethanolamines tank cars. The sampling pump should be worn for the length of time it takes to load the car.

2. Monitor for EO exposure during maintenance activity using the E.O. Trak sampling badges.

3. With the intention of setting a TEA exposure limit of 10 ppm, monitoring for airborne levels should be conducted during the amines plant turnaround.

4. Conduct annual area noise survey to document noise levels in block 55.

EVALUATION CRITERIA

Industrial Hygiene monitoring is performed to determine actual and potential exposure levels both as daily time- weighted averages(TWA) and peak or short-term excursion exposures. The results of personal monitoring are compared with recommended exposure guidelines for a health work environment. The guidelines used are at least as stringent, and in many cases are more stringent, than the Occupational Safety and Health Administration(OSHA) Permissible Exposure Level(PEL's). The guidelines are developed using toxicology, epidemiology, and industrial experience. they represent airborne concentrations of substances to which nearly all employees may be repeatedly exposed throughout a working lifetime without adverse effects. The exposure guidelines for the chemical and physical agents monitored in 1990/1991 at the Ethanolamines/ Glycol Ethers Plant are outlined below.

EXPOSURE GUIDELINES

	(1)	(2)	(3)	(4) T.I.M.E.
Physical Agent	TWA	STEL	SOURCE	Dow Registry Ref
Noise(5)	85dB	90dB Ceiling	Dow/OSHA	DR-8000-1032
Chemical Agent	**TWA**	**STEL**	**SOURCE**	**Dow Registry Ref**
Dowanol* PM	100PPM	150PPM	ACGIH	DR-0005-1945
Dowanol* EB	25PPM		ACGIH	DR-0000-0599
Monoethanolamines	3PPM	6PPM	ACGIH	DR-0000-6406
Diethanolamines	3PPM		ACGIH	DR-0000-6417
Triethanolamines	N.E.			DR-0103-1012
N-Butanol	50PPM Ceiling		ACGIH	DR-0002-3972

EXPOSURE GUIDELINES: continued

(1) TWA- 8 Hour Time Weighted Average
(2) STEL- Short Term Exposure Guidelines
(3) Source- Dow Industrial Hygiene Guidelines
(3) ACGIH- American Conference of Government Industrial Hygienists
(4) TIME- A Dow internal hazard data system in which information sheets are Obtained covering Toxicology, Industrial Hygiene, Medical and Environmental elements.

NOISE

The current Dow exposure guideline for noise is a 90 dB(A) ceiling. In addition, the Hearing Conservation Amendment document (29CFR 1910.95) issued by OSHA states that the 8-hour TWA noise exposures should not exceed 90 decibels as measured on the A-scale [dB(A)] of a sound pressure level meter at the slow response setting. Dow Louisiana Division expresses the guidelines as an 8-hour TWA of 85 dB(A). A TWA exposure of 85 dB(A) or more requires participation in a hearing conservation program. Areas that exceed the 90 dB(A) ceiling are posted with signs and mandatory hearing protection is required. For simplification, a 100% dose is the maximum allowable dose for the workday regardless if it is an 8 or 12- hour shift.

TOXICOLOGICAL INFORMATION

Toxicological data on the chemical and physical agents monitored at the Ethanolamines/ Glycol Ethers plant in 1990/1991 are available on the T.I.M.E. system.

SAMPLING AND ANALYTICAL METHODS

NOISE

Area noise level measurements were checked during 1990 and 1991 using B&K model 2205 sound level meter. The sound meter was checked for calibration using a B&K model 4230 calibrator. This meter was checked before and after use.

AIRBORNE CHEMICALS

Dowanol PM vapors were collected on Silica Gel tubes while being worn in the employees breathing zone. Air was drawn using portable battery operated pumps, capable of pumping at a flow rate of 50-200 ML/MIN. The pumps were set to the desired flow before each excursion using a bubble meter. They were also checked after use to calculate the average flow rate during the test.

Area sampling and short term excursions required a different flow volume. This necessitated the use of a pump capable of flow rates up to 1000 ML/MIN. The pumps were checked using the same bubble meter, before and after use.

Dowanol EB and N-Butanol vapors were tested using the same technique as Dowanol PM. Short term as well as extended excursions were tested. The same pumps, tubes, and procedures were used for these samples as were used for Dowanol PM samples.

These samples, Dowanol PM as well as Dowanol EB and N-Butanol, were put in envelopes and brought to the Environmental Services Lab for final analysis. these samples were accompanied by a blank to verify accuracy of test procedures. The results of these tests were processed and sent back with documentation to block 55.

Ethanolamines samples are taken in much the same way with a few exceptions. The tubes that are use are manufactured in the block 55 lab. This Method used for the sampling of block personnel requires that the tubes contain Activated Alumina. This is done by cutting tubes and inserting the alumina into the tube and plugging it with wool. The flow is then checked before use and again after use. The same flow rates are used for Ethanolamines testing as is for Glycol Ethers.

The tubes are brought to R&D for final analysis and the results are relayed back to the plant. A blank tube also accompanies this sample. These results are passed on to block 55 personnel for their review.

ANALYTICAL REPORT

The reports containing the Glycol Ethers monitoring results are located in the Environmental Services lab. The book number is 0217 and the results are located on pages 20,21,24,49,100, and 112. The samples were analyzed and results reported by Louise Almo, Lorinda Edwards, and J. Chustz.

The reports containing the Ethanolamines monitoring results are located in the R&D analytical laboratory, Bldg. 2503. The samples were analyzed by David Smith and reviewed by Steve Caldwell. The book number and pages are:
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book-5684 page-4
folder-9102.049

VENTILATION

Laboratory hoods were assessed using smoke tubes and an Alnot Model 8525 Thermo Anemometer air velocity meter to determine capture performance and hood face velocities.

RESULTS AND DISCUSSION

Personal and area monitoring were conducted during both routine and non routine work situations. The sample collection periods ranged from short term tasks (e.g. 15 minutes) to full shift, time-weighted average type samples.

The results of personal and area monitoring for airborne levels of Dowanol PM are shown in Table 1. The tasks being performed by personnel during personal monitoring exercises included collecting process samples, draining process equipment during product changeover, loading tank trucks and tank cars, and drumming product. The sampling results for these activities ranged from none detected (N.D.) to 3.0 ppm. The 3.0 ppm sample was taken over an 8-hour period during the filling of Dowanol PM drums. The area monitoring was conducted to determine airborne concentrations near the packaging line during drum filling operations, and in the dome area of tank trucks and tank cars during product loading. The listed Dowanol PM concentrations for this series of area samples ranged from the Limit of Quantitation (L.O.Q.) of <0.12 ppm to 190 ppm. The 190 ppm Dowanol PM sample was collected near an open tank car dome during loading activities. Over the period of time required to fill this tank car, the loading operator was monitored to determine his exposure level. The result of this 80 minute, personal type sample was L.O.Q (<0.90 ppm). The significantly lower operator monitoring result was attributed to the fact that the loader does not spend much time in the tank car dome area, and the close downwind location of the area sampling device. The ACGIH 8-hour TLV-TWA exposure guideline for Dowanol PM is 100 ppm.

Table 2 shows the results of personal and area sampling for Dowanol EB and Butanol. The monitoring activity took place during several product turnarounds, drum filling work, routing outside rounds, and tank truck/tank car loading. All Dowanol EB personal and area monitoring results were N.D. except for one 60 minute area sample of 4.2 ppm that was collected while loading a tank truck. The ACGIH 8-hour TLV-TWA exposure guideline for Dowanol EB is 25 ppm. A 25 minute task which involved sampling a N-Butanol barge was monitored. The analysis for this sample showed a potential exposure level of 8 ppm. This represents a potential exposure as personnel performing the sampling task were required to wear a half-face organic vapor acid gas respirator. The OSHA permissible exposure limit for N-Butanol is a 50 ppm ceiling value.

Table 3 shows the results of personal and area sampling conducted to determine airborne concentrations of Monoethanolamine(MEA), Diethanolamine(DEA), and Trithanolamine (TEA) during various job tasks and process operations. The personal type sampling results for MEA, DEA, and TEA ranged from N.D. (0.01 ppm) to 231 ppm, from N.D. to 16 ppm, and from N.D. to 28 ppm, respectively. The high results for all three compounds were obtained from the same sample taken during the loading of a monoethanolamine tank car on 2/27/91. The validity of this sample is questionable since the high purity MEA produced contains no TEA, and the MEA and DEA levels reported are high compared to previous results. To reach 231 ppm MEA in a 29 minute sample would almost certainly require liquid contact. A personal 8- hour TWA sample also taken while loading a MEA tank car on 6/19/91 showed none detected (N.D.) results for all three compounds. Half face OVAG respirators were worn while operators were on the tank cars.

RESULTS AND DISCUSSION: continued

Two excursion type area samples were collected in 1990 during the loading of MEA tank cars. The location of the pumps and tubes for each sampling were selected to provide "worse case" downwind, in close proximity to the open dome. The air borne levels of MEA for these two samples were 25 ppm and 7.3 ppm. These results were significantly less than the 231 ppm personal sample taken in 1991.

A full shift(8 hour) personal sample was collected during MEA drumming operations. The result of this sampling was concentration in air of MEA at 5.8 ppm. This occured with the local exhaust ventilation system not in use. A following personal monitoring exercise of the same task with the pump worn by the same individual resulted in a N.D. (None Detected) reading. The results are shown on table 3.

An area noise survey was conducted in 1991 to document historical sound levels in the Ethanolamines/Glycol Ethers plant. The process area noise level readings ranged from 77 dB(A) to 98 dB(A). The 98 dB(A) reading was taken in the area of C-550 A and B. The C-550 area is a mandatory hearing protection area since noise levels exceed 90 dB(A). The other high readings were encountered at the tank car loading rack (102 dB(A)) and at the drum filling station (97 dB(A)). Both measurements were made during the operation of an impact wrench which caused the high readings. The wearing of hearing protectors are required in both of these situations.

Included in this report are the results of the I.H. Departments 1991 survey of the Q.C. lab' s two fume hoods. Following some hood housekeeping and maintenance work, the north hood received a "B" rating and the south hood a "B".

TABLE: 1 Results of Employees' Time-Weighted Average(TWA) Exposure and Area Monitoring Simulating Breathing Zone Height for Airborne Concentrations of Dowanol*PM at the Louisiana Division Ethanolamines/Glycol Ethers Plant, Plaquemine, Louisiana, During 1990 and 1991

MASTER NO.	JOB ASSIGN.	DATE	TIME(MIN.)	CONCENTRATION ppm(v/v)	COMMENTS
PERSONAL SAMPLES:					
432925	SOS	02/08/91	540	N.D. (0.23)	Routine Rounds
432045	SOS	12/12/90	450	0.43	Glycol Ether Drainout
240436	OST	10/03/90	420	N.D. (0.25)	Loading T/T's
433370	SOS	05/24/90	390	N.D. (0.56)	Glycol Ethers Drainout
435-94-3142	Contract	05/21/90	480	3.0	Drumming Dowanol*PM
435-94-3142	Contract	04/11/90	450	2.3	Drumming Dowanol*PM
432925	SOS	04/10/90	630	0.35	Glycol Ethers Drainout
432302	SOS	04/11/90	390	0.07	Dowanol*EB Startup
432925	SOS	03/08/90	80	LOQ (<0.90)	Loading Dowanol*PM Tankcar
095295	OS	01/19/90	600	N.D. (0.14)	Routine Sample Rounds
AREA SAMPLES:					
10584	Drumming Area	12/05/90	300	7.7	Drumming Dowanol*PM
10586	T/T Loading Area	10/03/90	420	N.D. (0.25)	Loading T/T's
10081	T/C Loading Area	05/04/90	40	190	Sampling Device Setting In T/C Dome Area(1)
10006	T/T Loading Area	03/13/90	60	LOQ (<0.12)	Sampling Device Setting In T/T Dome Area(1)
10082	T/C Loading Area	03/08/90	80	31	Sampling Device Setting On T/C During Purging and Loadin

Industrial Hygiene Exposure Guideline

ACGIH TLV 8 Hr. TWA 100

(1) Half face OVAG resporator worn during this task.

LOQ- Detectable amount but below the analytical limit of quantitation for the survey sampling conditions.

ND- None detected with the analytical limit of quantitation noted in parenthesis.

TABLE: 2 Results of Employees' Time-Weighted Average(TWA) Exposure and Area Monitoring Simulating Breathing Zone Height for Airborne Concentrations of Dowanol*EB and N-Butanol at the Louisiana Division Ethanolamines/Glycol Ethers Plant, Plaquemine, Louisiana, During 1990 and 1991

				CONCENTRATION,ppm(v/v)		
MASTER NO.	JOB ASSING.	DATE	TIME(MIN.)	DOWANOL*EB	N-BUTANOL	COMMENTS
PERSONAL SAMPLES:						
096074	OS	06/06/90	25		8.0	N-Butanol Barge Sampling(1)
432302	SOS	05/24/90	390	N.D. (0.42)		Glycol Ethers Swapover
433370	SOS	05/24/90	390	N.D. (0.56)		Glycol Ethers Swapover
435-94-3142	Contract	05/21/90	480	N.D. (0.35)		Drumming Dowanol*PM
435-94-3142	Contract	04/11/90	450	N.D. (0.37)		Drumming Dowanol*PM
432925	SOS	04/10/90	630	N.D. (0.26)		Glycol Ether Swapover
432925	SOS	03/08/90	80	N.D. (0.69)		Loading Dowanol*PM T/C's(1)
095295	OS	01/19/90	600	N.D. (0.14)		Routine Outside Rounds
AREA SAMPLES:						
		05/04/90	40	N.D. (0.13)		T/C Loading(1)
		03/13/90	60	4.2		T/T Loading
		03/08/90	80	N.D.(0.10)		Loading Dowanol*PM T/C's(1)

Industrial Hygiene Exposure Guideline		
ACGIH TLV 8 Hr. TWA	25	50 Ceiling

(1) Half face OVAG respirators worn during this task
ND- None detected with the analytical limit of quantitation noted in parenthesis.

TABLE: 3 Results of Employees' Time-Weighted Average(TWA) Exposure and Area Monitoring Simulating Breathing Zone Height for Airborne Concentrations of Ethanolamines at the Louisiana Division Ethanolamines/Glycol Ethers Plant, Plaquemine, Louisiana, During 1990 and 1991

				CONCENTRATION,ppm(v/v)			
MASTER NO.	JOB ASSIGN.	DATE	TIME(MIN.)	MEA	DEA	TEA	COMMENTS
PERSONAL SAMPLES							
436-21-3474	Contract	08/01/91	450	N.D.	N.D.	N.D.	Drumming
434283	OS	06/19/91	480	N.D. (0.02)	N.D.	N.D.	T/C Loading(1)
242215	OS	02/27/91	29	231	16	28	T/C Loading(1)
095295	SOT	02/18/91	420	N.D. (0.01)			Drumming
436-21-3474	Contract	02/01/91	480	5.8			Drumming
96074	OS	01/11/90	15	N.D. (0.44)			Sampling Amines Feed Filter
434283	OS	12/12/90	510	N.D. (0.02)			Drumming
AREA SAMPLES							
		05/04/90	35	25			Loading T/C(1)
		02/03/90	40	7.3			Loading T/C(1)
Industrial Hygiene Exposure Guideline							
ACGIH TLV 8 Hr. TWA				3	3	N.E.	
ACGIH TLV STEL				6			

N.E.- None Established
(1) Half face OVAG respirator worn during this task.
ND- None detected with the analytical limit of quantitation noted in parenthesis.

TABLE 4: Area noise level survey readingl at the Ethanolamines/ Glycol Ethers Plant, Louisiana Division, Plaquemine, La. conducted in 1991.

AREA			dBA Reading
MCC			72
CONTROL ROOM			64
COMPUTER ROOM			72
MAINTENANCE SHOP			70
AREA 1:	T-130		79
	DV-115		80
	P-104		77
	R-101		79
AREA 2:	DV-273B		79
	E-215		77
	R-201		78
	P-201		86
CT-500			86
C-550 A/B			98
DV-511			85
AREA 3			68
DRUMMING BUILDING:		DRUM BUNG WRENCH	102
		REGULAR DRUMMING	75
		TOW MOTOR	80
IMPACT WRENCH ON TANK CAR RACK			97

CALIBRATION RECORD FOR NOISE SURVEY

SOUND LEVEL METER: B&K
MODEL TYPE 2205
SERIAL # 395509

CALIBRATED WITH: B&K CALIBRATOR
MODEL TYPE 4230
SERIAL # 396558

CALIBRATION RECORD: BEFORE- 94 dBA
AFTER- 94 dBA

FIGURE 1

1991 NOISE AUDIT

DRUMMING BLDG.

1020 impact wrench

75DB drumming

80 DB from Tow motor

Tanko Car Impact Wrench 91 DB

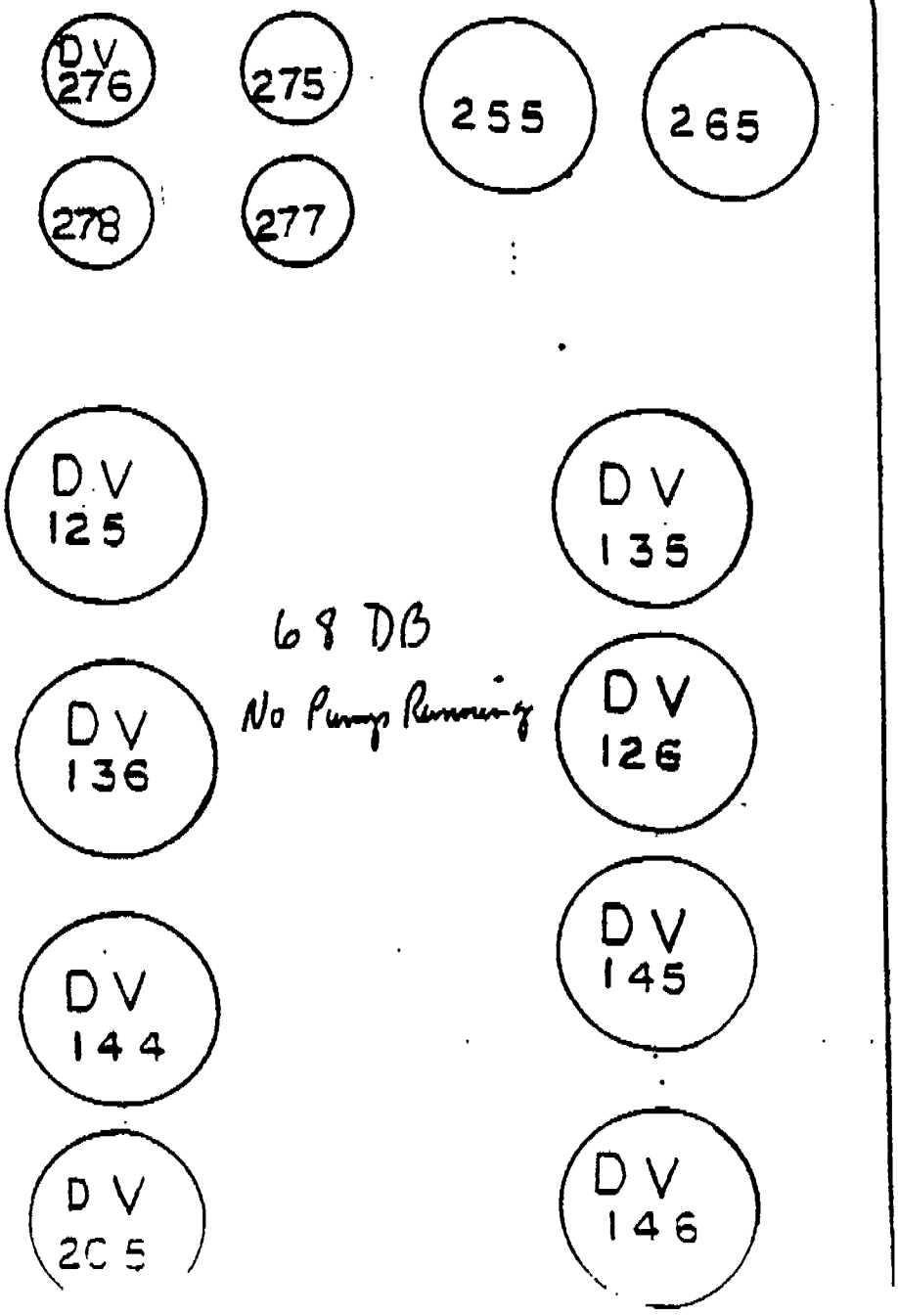

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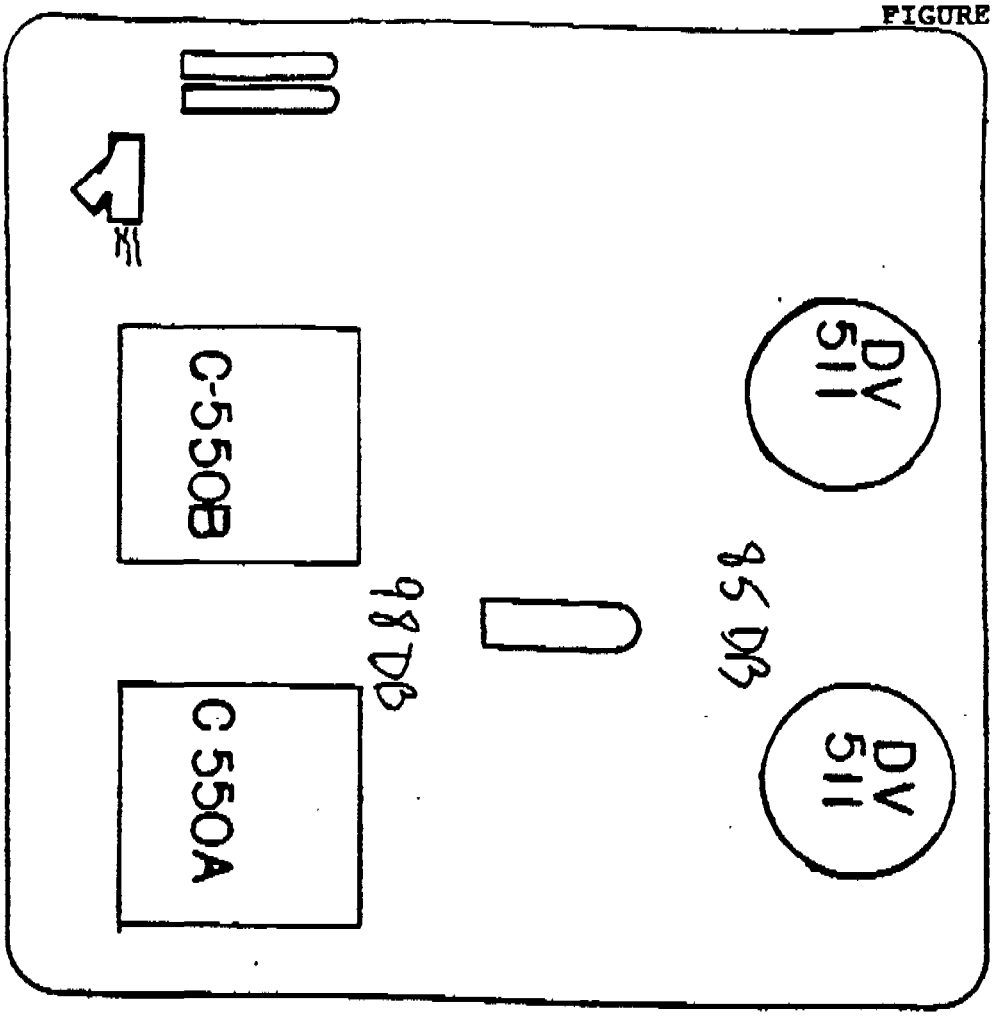
FIGURE 2

NOISE AUDIT

1991



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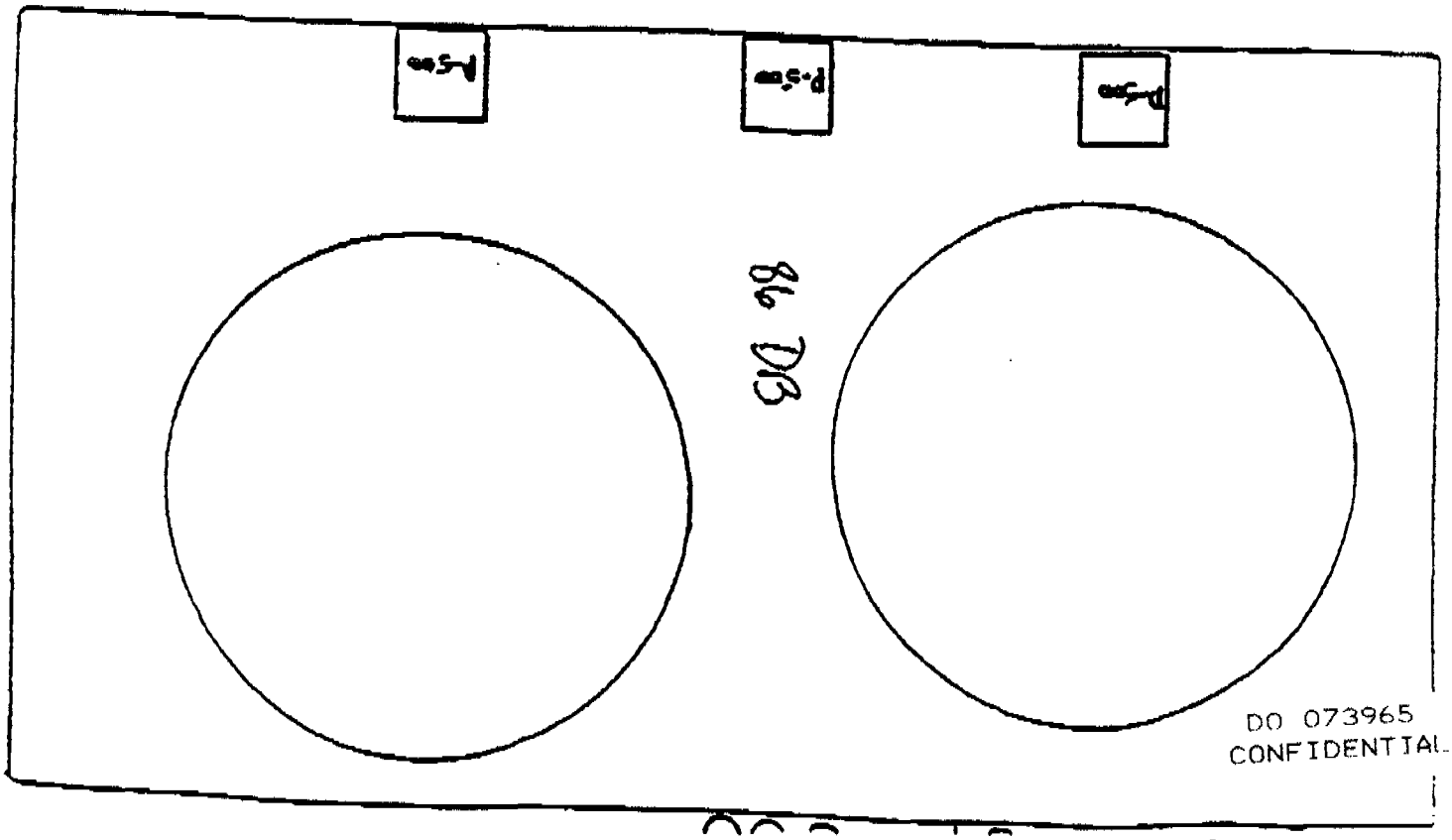

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1991

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AREA-2
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PAGE 16
DO 073966
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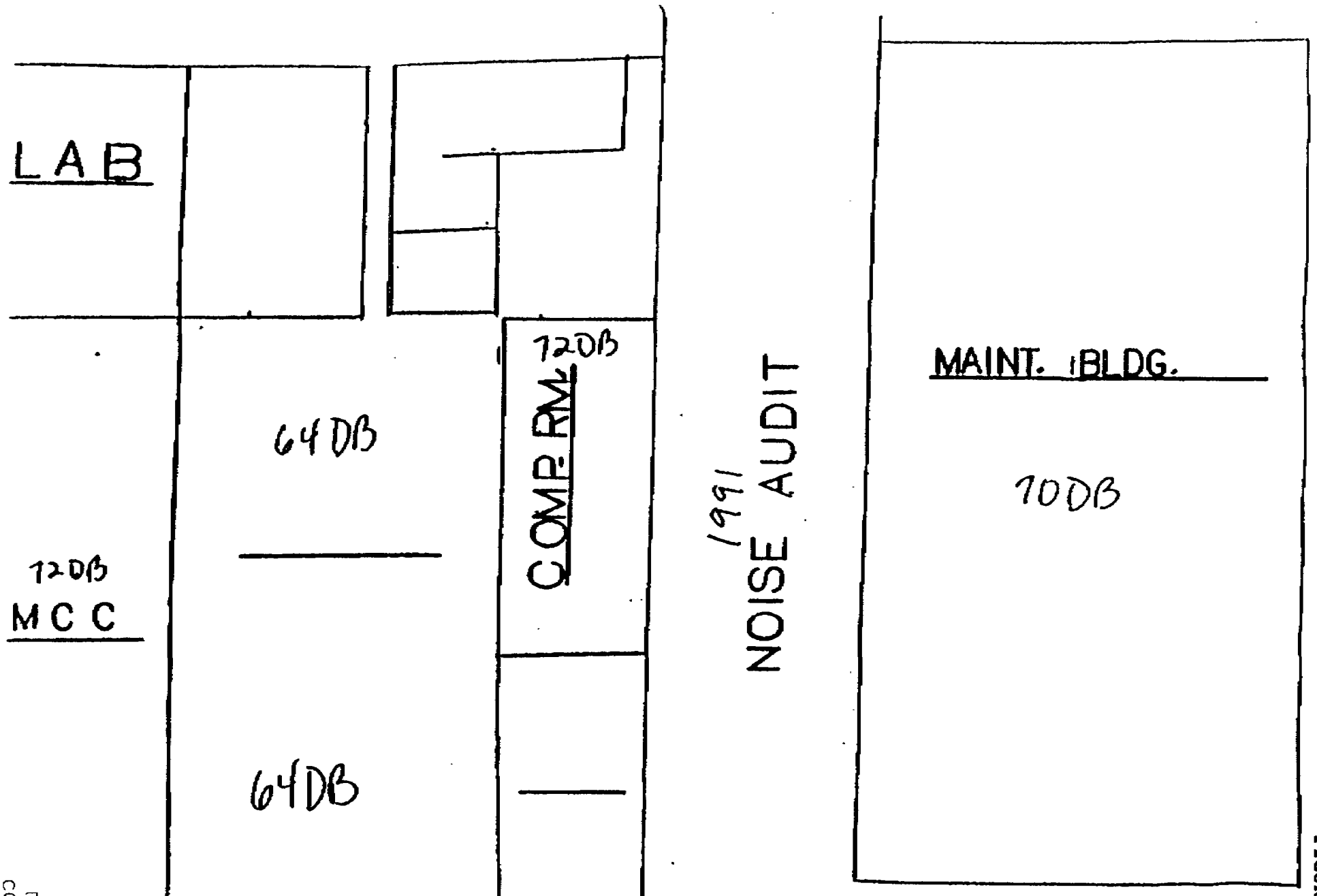

FIGURE 1

FIGURE 5

LOUISIANA DIVISION

INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

PLANT: Ethanolamines/Glycol Ethers Building 5501 DATE: November 25, 1991
HOOD I.D.: Lab Hood/North TESTED BY: Darlene Creel

Static Pressure Reading _____

Hood Face Velocity Readings at a(n) 28" (fully opened) Sash Opening.

83	79	99
69	42	71
58	62	78

Smoke Tube Observations With a(n) 28" Sash Opening -

****POOR (Air capture by hood is weak and/or not well defined. Turbulence inside the hood and smoke observed escaping hood face.)

Designation	Sash Hood Opening	(FPM) FV	(FPM) FVm	Classification
Lab Hood/North	28"	71	42	**

** INADEQUATE

Used the Alnor Model 8925 Thermo Anemometer.

FV = Average Face Velocity
FVm = Minimum Measurement
FPM = Feet Per Minute

FIGURE 6

LOUISIANA DIVISION

INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

PLANT: Ethanolamines/Glycol Ethers Building 5501 DATE: November 25, 1991
HOOD I.D.: Lab Hood/North TESTED BY: Darlene Creel

Static Pressure Reading 1.95

Hood Face Velocity Readings at a(n) 18" Sash Opening.

129	130	110
126	90	115
122	90	108

Smoke Tube Observations With a(n) 18" Sash Opening -

*****GOOD (Air capture by hood is strong and well defined with minimal internal turbulence, and no observable smoke swirling back to hood face when person stands at hood face.)

Designation	Sash Hood Opening	(FPM) FV	(FPM) FVm	Classification
Lab Hood/North	18"	113	90	"B"

Used the Alnor Model 8925 Thermo Anemometer.

FV = Average Face Velocity
FVm = Minimum Measurement
FPM = Feet Per Minute

FIGURE 7

LOUISIANA DIVISION
INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

PLANT: Ethanolamines/Glycol Ethers Building 5501 DATE: November 25, 1991
HOOD I.D.: Lab Hood/South TESTED BY: Darlene Creel

Static Pressure Reading 1.5

Hood Face Velocity Readings at a(n) 18" Sash Opening.

94	90	100
79	74	69
64	52	55

Smoke Tube Observations With a(n) 18" Sash Opening -

****POOR (Air capture by hood is weak and/or not well defined. Turbulence inside the hood and smoke observed escaping hood face.)

Designation	Sash Hood Opening	(FPM) FV	(FPM) FVm	Classification
Lab Hood/South	18"	75	52	**

** INADEQUATE

Used the Alnor Model 8925 Thermo Anemometer.

FV = Average Face Velocity
FVm = Minimum Measurement
FPM = Feet Per Minute

FIGURE 8

LOUISIANA DIVISION

INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

PLANT: Ethanolamines/Glycol Ethers Building 5501 DATE: December 2, 1991
HOOD I.D.: Lab Hood/South TESTED BY: Darlene Creel

Static Pressure Reading 2.00

Hood Face Velocity Readings at a(n) 18" Sash Opening.

131	135	149
121	111	123
99	97	98

Smoke Tube Observations With a(n) 18" Sash Opening -

****GOOD (Air capture by hood is strong and well defined with minimal internal turbulence, and no observable smoke swirling back to hood face when person stands at hood face.)

Designation	Sash Hood Opening	(FPM) FV	(FPM) FVm	Classification
Lab Hood/South	18"	118	97	"B"

Used the Alnor Model 8925 Thermo Anemometer.

FV = Average Face Velocity
FVm = Minimum Measurement
FPM = Feet Per Minute